Pollinator Protection: Growers' Perspective

By Gabriele Ludwig– Almond Board of California

PPDC April 20, 2011

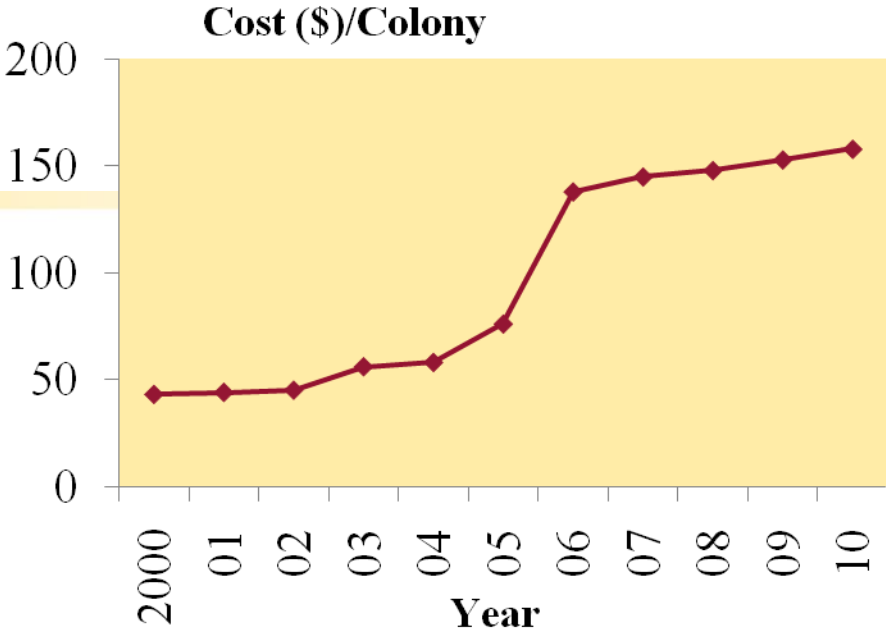
Pollinators and Food/Fiber Production

- Many crops rely on pollinators to produce the fruit or seed, or to enhance yields.
- Examples for crops dependent on pollinators: almonds, melons, sunflowers, rape/canola, figs (wasps), stone fruit, pome fruit, various berries, seed alfalfa (leaf cutter bees), seed onions, greenhouse tomatoes (bumble bees), etc.
- Examples of crops used for honey production include citrus, strawberries, cotton, etc.

Why do Almonds Need Bees?

- Almond varieties are self-incompatible (pollen of same variety doesn't work)
- Each orchard is planted typically 3 varieties of almonds to allow cross-pollination
- Rely on bees to move the pollen from one variety to another
- Need pollination services mid-February through mid-March

Almond Demand for Honey Bee Colonies



Almond acreage has doubled in 25 years:

- 740,000 bearing almond acres in 2010
- x 2 hives/acre ~ 1.5 mill colony demand
- (out of ~ 2.4 mill commercial colonies available in the US.)

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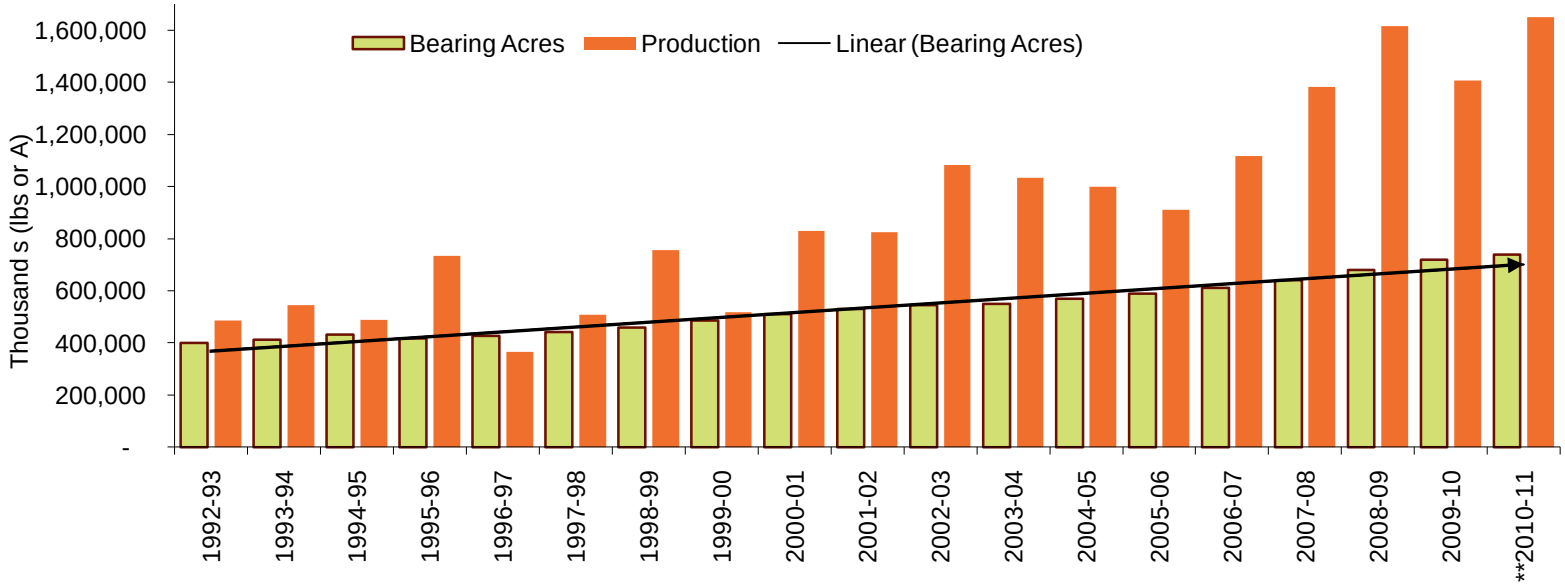

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Why do Almonds need Fungicides at Bloom?

A number of key almond disease infections occur during bloom, especially when there is rain (rainy season in CA). These pathogens cause significant damage to the nuts, but more importantly to the long term health of the tree.

Note: Not all indicated timings may be necessary for disease control.

Disease	Dormant	Bloom			Spring[1]		Summer	
		Pink bud	Full bloom	Petal fall	2 weeks	5 weeks	May	June
Alternaria	—	—	—	—	—	+++	+++	+++
Anthracnose[2]	—	++	+++	+++	+++	+++	+++	++
Brown rot	—	++	+++	+	—	—	—	—
Green fruit rot	—	—	+++	—	—	—	—	—
Leaf blight	—	—	+++	++	+	—	—	—
Rust	—	—	—	—	—	+++	+++	+[3]
Scab[4]	+	—	—	++	+++	+++	++	—
Shot hole[5]	+[6]	+	++	+++	+++	++	—	—

Rating: +++ = most effective, ++ = moderately effective, + = least effective, and — = ineffective

website: www.ipm.ucdavis.edu

Brown rot fungi overwinter on dead blossoms. Photo by Jack Kelly Clark.

Twig dieback, dead leaves, and mummified fruit caused by anthracnose. Jack Kelly Clark.

Almond Grower Investment in Bee Health

ABC Pollination research since 1976, investing $1.8 million

- Largest, most sustained of any commodity organization
- Honey bee health a focus since 1995 – nutrition, pest/disease management, impact of pesticides - $1.2 million spent
- Since 2003, more than $750,000 spent on over 45 projects including Colony Collapse Disorder (CCD)

2010-11 projects include honey bee stock improvement, Nosema control, Varroa control, bee nutrition

Programs for Pollinator (Honey Bee) Protection

Grower groups and Extension provide advice how to minimize the interaction between honey bee and needed pesticide applications.

Examples of measures include:

- Spray late afternoon/evening after any pollen has been shed and after bee activity (fungicides/ short residual insecticides)
- Avoid certain fungicides known to have impacts on honey bees
- If can, avoid using insecticides during bloom
- Select insecticides with lower toxicity to honey bee during bloom.
  - Lists of insecticides that include bee toxicity and residue duration
- Remove (mow/herbicide) blooming cover crops before insecticide treatments with known toxicities
- Registries for location of bee hives in various states/counties
- Have contact information for bee hive owners nearby
- Avoid spray drift
- Read the label

UC IPM Guidelines

UC IPM Pest Management Guidelines—University of California's managing pests in agriculture, floriculture, and commercial turf. More

| Authors/credits | Index to

General Information

- Monitoring Pests at Bloom (11/09)
- Relative Toxicities of Insecticides and Miticides Used in Cherries to Natural Enemies and Honey Bees (5/10)
- General Properties of Fungicides Used in Cherries (11/09)
- Most Effective Treatment Timings for Key Diseases (5/10)
- Fungicide Resistance Management (5/10)

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How to Manage Pests
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Almond

Approximate Impact Ratings of Various Pest Management Tools Against Natural Enemies

(Reviewed 3/09, updated 3/09)

In this Guideline:

- Publication
- Glossary

Pest Management Tools	Treatment Timing	Mode of Action[1]	Toxicities to:							
			Parasites		Predators		Predator mites		Honey Bees	
			Acute	Residual	Acute	Residual	Acute	Residual	Acute	Residual
abamectin (Agri-Mek)	inseason	6	L/M	L	L/H	L	L/M	L	H	—
acequinocyl (Kanemite)	inseason	20B	—	—	L	L	L	L/M	L	—
azinphosmethyl (Guthion)	inseason	1B	H	M/H	H	H	L/H	L/H	H	H
Bacillus thuringiensis ssp.*kurstaki*	bloom/inseason	11.B2	L	L	L	L	L	L	L	L
bifenazate (Acramite)	inseason	25								
bifenthrin (Brigade)	dormant	3								
buprofezin (Centaur)	inseason	16								
carbaryl (Sevin)	inseason	1A								
chloropyridazin/sulfur (Desperado)	inseason	—								
chlorpyrifos (Lorsban)	dormant	1B								
chlorpyrifos (Lorsban)	inseason	1B								

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Honey Bees and Agricultural Sprays

by Eric Mussen, Extension Apiculturist, UC Davis

Growers of conventional and organic crops are faced with choices concerning controlling invertebrate pests and crop diseases in their fields and orchards. Often the chemicals of choice are applied to the crops in aqueous sprays, delivered by ground rigs or by air. Although essential for crop protection, those applications can be detrimental to honey bees. The following information pertains to those problems.

Cooperative Extension: Maine's Native Wild Blueberries

Protecting Honey Bees from Insecticides

- All pesticides are not equally hazardous to bees. Select the one that is least hazardous. Commonly used insecticides are listed in the chart according to their relative hazards.
- Do not apply insecticides near honey bee hives.
- Treat plants before (check persistence for each insecticide) or after bloom, at night with low persistence insecticides, or when bees are not actively foraging in crop and pruned fields.

Cultural Management for Insects and Diseases in Wild Blueberries.

Insects	Method	Comments
Blueberry Maggot	Harvesting	Harvesting techniques that reduce fruit loss can minimize the number of infected fruit left on the plants and on the ground.
	Management	Keep isolated fields in same cycle.
	Winnower cleanup	Compost, burn or dispose of winnower refuse.
Flea Beetle, Sawfly, Spanworm	Fire pruning	Blueberry litter must be ignited.
Thrips	Fire pruning	Burn curled stems as soon as extensive curling occurs in early spring, but not later than June 1 in a nonbearing crop or reduction in next year's fruit buds will occur.

Toxicity Rating of Blueberry Insecticides

L-Low **VL**-Very Low **M**-Medium **H**-High **VH**- Very High **N**-None-Slight

Insecticide	Oral	Dermal	Mammal	Fish	Bird	Bee	Environmental Persistence
Admire/Provado* *(imidacloprid)*	M	L	M	M	H	VH*	M
Assail *(acetamiprid)*	L	L	L	VL	L	L	L
Asana *(esfenvalerate)*	M	L	M	H	M	H	M
Botanigard *(Beauveria bassiana)*	N	N	N	N	N	VL	VL
BT *(Bacillus thuringiensis)*	VL	VL	VL	VL	VL	VL	VL

Bees - 630-Wild Bee Conservation for Wild Blueberry Fields

Fact Sheet No. 630, UMaine Extension No. 2111

Prepared by Francis A. Drummond, Professor of Insect Ecology and Constance Stubbs, Assistant Scientist, the University of Maine Cooperative Extension, Orono, ME 04469. June 2003

Why Conserve Native or Wild Bees?

Wind and rain are important in the reproduction of many trees and grasses, but the majority of flowering plants in Maine are pollinated by animals. Small mammals and birds play a minor but important role as pollinators. However, it is the insects that are by far the most significant pollinators in Maine. The insects (jointed six legged animals) are the most abundant group of terrestrial animals, usually numbering in the tens of millions in an acre of old field. In addition, the

2011 Crop Protection Guide for Tree Fruits in Washington

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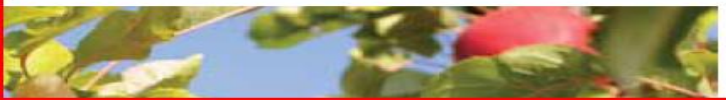

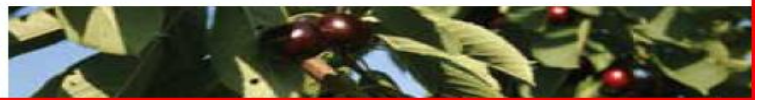

Hazards to Bees

Bee Protection

Honey bees are necessary for the pollination of fruit trees. Orchardists must make a sincere effort to protect them.

Even though pesticides are applied to orchard trees, some of the spray may settle on blooming broadleaf weeds in the cover crop and kill foraging honey bees. The following precautions will help prevent bee kills and ensure adequate pollination:

1. Do not place honey bees in an orchard until blossoms are open. This will help minimize the number of bees foraging on blooming weeds in the cover crop.
2. Application of insecticides to blossoming orchards can kill foraging honey bees. Insecticide residues on blooming broadleaf weeds in orchard cover crops can also cause bee kills. Never apply insecticides that are hazardous to bees (see following table) when any blossoms are open in the orchard, or allow insecticide drift onto blooming weeds in cover crops, or onto adjoining orchards that are blossoming.
3. Controlling blooming broadleaf weeds (e.g. clover, dandelion, mustard) in orchards is an

Toxicity of Pesticides to Bees

See PNW 591, *How to reduce Bee Poisoning from Pesticides* **for further information.**

I Hazardous at any time on blooming crops and weeds	II Not hazardous if applied in evening except during high temperatures[1,2]	III Not hazardous if applied in late evening or early morning except during high temperatures[1,3]	IV Not hazardous to bees at any time on blooming crops
Actara 25WDG (thiamethoxam)	Carzol 92SP (formetanate hydrochloride)	Acramite 50WS (bifenazate)	Altacor 35WDG (chlorantraniliprole)
Admire 2F (imidacloprid)	Confirm 2F (tebufenozide)	Assail 30SG (acetamiprid)	Apollo 4SC (clofentezine)
Admire Pro 4.6L (imidacloprid)	Epi-Mek 0.15EC (abamectin)	Assail 70WP (acetamiprid)	*Bacillus thuringiensis* subsp. kurstaki
Ambush 25WP (permethrin)	Malathion 8EC (malathion)	Avaunt 30DG (indoxacarb)	Beleaf 50SG (flonicamid)
Asana 0.66EC (esfenvalerate)	Thionex 3EC (endosulfan)	Aza-Direct 1.2%L (azadirachtin)	Centaur 70W (buprofezin)
Belt 4SC (flubendiamide)	Thionex 3EC - trunk spray (endosulfan)	Battalion 0.2EC (deltamethrin)	Cyd-X (CM granulosis virus)
Captan 50WP (captan)	Thionex 50W (endosulfan)	Calypso 4F (thiacloprid)	Dicofol 4E (dicofol)
Clutch 50WDG (clothianidin)		Delegate 25WG (spinetoram)	Dimilin 2L (diflubenzuron)
Danitol 2.4EC (fenpropathrin)		Entrust 80W (spinosad)	Esteem 35WP (pyriproxyfen)

The Cranberry Institute provides annually updated 'Pesticide Charts' to all cranberry growers which includes icons indicating relative pollinator risk for specific pesticides available for use on cranberries as a guide.

Balancing Need for Pest Control Tools with Pollinator Protection/Supply

Factors for PPDC Members to consider:

- Currently there are a number of efforts in existence to reduce honey bee/pesticide interactions
- Very complex issue with a number of non-pesticide related issues also affecting honey bee/pollinator health
- Data on effects on colony health are limited.

➔ Growers need pest control materials and during bloom periods

- Next steps:
  - Task force?
  - How to improve pollinator consideration in pest management choices?
  - How to improve communication about locations of bee hives?
  - How to improve applicator licensing education?
  - What of existing programs could be extended?